NASA TECH BRIEF

Langley Research Center

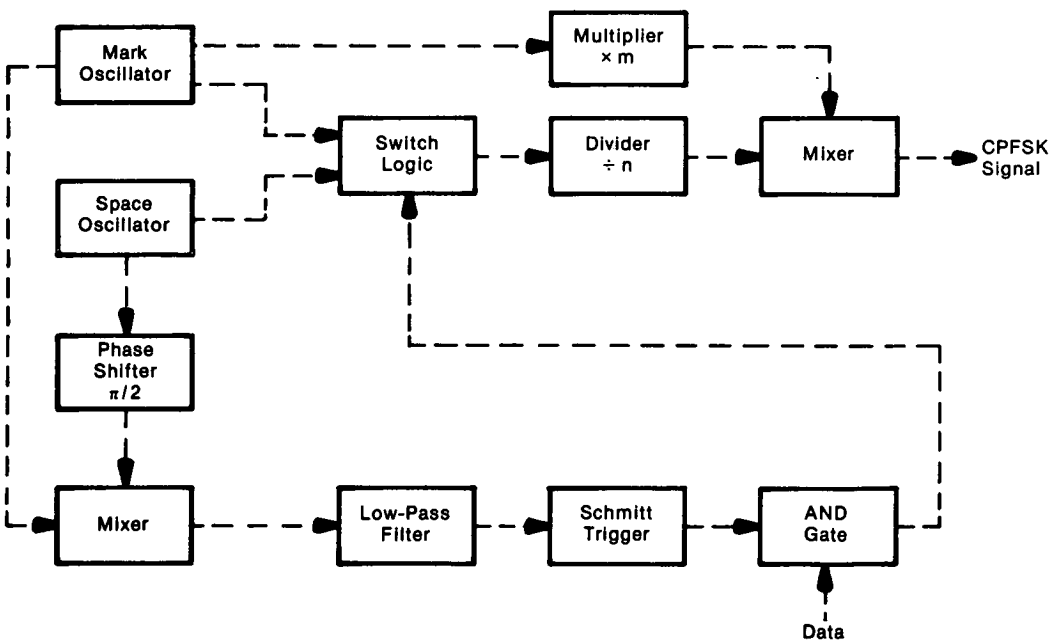
Continuous-Phase Frequency-Shift-Keyed Generator

A new continuous-phase frequency-shift-keyed (CPFSK) generator has excellent frequency stability and requires a relatively-small transmission bandwidth. It is particularly suited for binary-data transmission when the available bandwidth is limited.

There are two basic methods of generating frequency-shift-keyed signals. One method is based on switching the outputs of two independent crystal oscillators and offers excellent frequency stability. However, because the two crystal oscillators are independent, there is a phase discontinuity during the transition from a "space" to a "mark" or vice versa. This discontinuity results in a large transmission-bandwidth occupancy and presents problems in the detection process (large overshoots).

The other method is based on modulating a voltage-controlled oscillator by the data stream. In this method, while the phase is continuous, the frequency stability is poor and depends strongly on the stability of the modulator.

The CPFSK generator (see block diagram) combines the desired features of both basic methods: the frequency stability of crystal oscillators and the phase continuity of voltage-controlled oscillators. While two independent crystal oscillators are used, the switching due to data transition is delayed until both oscillators are in phase coincidence. The sensing of phase difference between oscillators is accomplished by observing the beat note of the two oscillators. Since one of the oscillators is shifted in phase by 90°, the



CPFSK Generator Diagram

(continued overleaf)

output is zero when both oscillators are in phase coincidence. The Schmitt trigger operates on the positive slope only, and the delayed switching will result in asymmetry of transmitted data. However, with a proper choice of crystal oscillator frequency and corresponding division factor n, the asymmetry can be reduced to any desired percentage of bit duration.

A CPFSK generator was constructed for a uhf relay transmitter. The frequency stability of this system was 10^{-5} at -10° to +52° C, the modulation bandwidth was 600 kHz, the data rate was 32 kHz square wave, and the rise time was 1.4 μs at output.

Note:

No further documentation is available. Specific questions, however, may be directed to:

Technology Utilization Officer
Langley Research Center
Mail Stop 139-A
Hampton, Virginia 23665
Reference: B75-10218

Patent status:

NASA has decided not to apply for a patent.

Source: Max S. Feryszka of
RCA Corp.
(LAR-11638)

Categories: 02 (Electronics Systems)
01 (Electronics - Components
and Circuitry)